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THESIS

A METHOD FOR THE DESIGN AND IMPLEMENTATION OF A LOGISTICS MANAGEMENT INFORMATION SYSTEM FOR THE INDONESIAN DEPARTMENT OF DEFENSE LOGISTICS STAFF

by

Dwi Soeroso
and
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March 1985

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This thesis addresses an appropriate methodology to design and implement a Computer-Based Information System for the Indonesian Department of Defense Logistics Office. It initially describes the existing logistics MIS support, discusses current MIS methodologies and finally examines and evaluates an appropriate methodology. The method will be presented by developing an application of the small arms inventory system, as an example case. (Continued)

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A Method for the Design and Implementation of a Logistics Management Information System for the Indonesian Department of Defense Logistics Staff

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MASTER OF SCIENCE IN INFORMATION SYSTEMS

from the

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ABSTRACT

This thesis addresses an appropriate methodology to design and implement a Computer-Based Information System for the Indonesian Department of Defense Logistics Office. It initially describes the existing logistics MIS support, discusses current MIS methodologies and finally examines and evaluates an appropriate methodology. The method will be presented by developing an application of the small arms inventory system, as an example case.

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I. INTRODUCTION

"The government are very keen on amassing statistics. They collect them, raise them to the Nth power, take the cube root and prepare wonderful diagrams. But you must never forget that every one of those figures comes in the first instance from the village watchman, who just puts down what he damn pleases."

Sir Josia Stamp (1880-1941)

A. BACKGROUND

To meet the annual budget requirement, the Office of the Indonesian Defense Logistics Assistant needs to maintain current status regarding its equipment inventory. There are nine major item groups to be concerned with:

Air Craft, Ships, Combat Vehicles, General and Special Purpose Vehicles, Small Arms and Weapons, Construction Equipment, Medical Equipment and Facilities, Stationary Equipment, and Properties and Installations.

In an attempt to acquire the necessary data, the Indonesian Department of Defense (DOD) launched a materiel census in early 1972. Data was collected and processed using available computers at the Administration Department of the Army and at the Police Headquarters. Although the census was intended to achieve a standardized system to manage equipment, the result turned out to be far from what the managers expected. Due to both the volume and the variety of items.

Four years later, a task force was assigned to update the census data. However, there were no significant improvements of note. Based on the complexities of the 1972 census

data, the Defense Logistics Staff Office concentrated on three groups of major items as pilot projects for data collection in 1981 [Ref. 1: p. 9-9], Small Arms and Weapons, General and Special Purpose Vehicles, and Properties and Installation. These items were selected because of their importance and urgency. Small Arms and Weapons are important items for combat operation; Vehicles provide mobility for troops and require fuel controls; Properties and Installations are considered a major concern of the Logistics Office. The data obtained from this census was still being evaluated.

In 1973 the DOD established the MIS Board, followed by the Data Processing Center in 1975, in an effort to control future MISs. Four major areas of concern were Personnel, Finance, Logistics, and Strategy and Combat Operations [Ref. 2: p. 7-10]. A joint taskforce consisting of both Functional Managers and Data Processing Personnel was assigned to develop MISs in all the previous areas. Little activity occured in the Logistics area during 1976 through 1979; but in 1980 an approach was developed and followed with data collection in 1981. The events, beginning with the material census in 1972, followed by analysis and update of 1972 data in 1976, and additional data collection in 1981, indicate a strong desire for an ongoing effort to establish a logistics MIS.

B. MANAGEMENT INFORMATION SYSTEM DEFINED

Since many Management Information System (MIS) definitions abound, it is appropriate to clearly define the term MIS as used in this study. Dearden has suggested, it is difficult to describe MIS in a satisfactory way because this conceptual entity is embedded in a "mish-mash" of fuzzy

thinking and incomprehensible jargon [Ref. 3: p. 90-93]. Limited by the scope of this study and the general perception of MIS within the logistics community of the Indonesian DOD, an MIS is herein defined as an integrated, computer-based system for providing past, present, and projected information relating to internal operations and external intelligence. It should support the planning, control, and operational functions of an organization by furnishing uniform information in a usable time-frame to assist the decision maker [Ref. 4: p. 122].

C. STATEMENT OF THE PROBLEM

One of the major factors affecting the eventual success or failure of the logistics MIS in the Office of The Indonesian Defense Logistics Assistant is the existence of a formal, written methodology standard for the design and implementation of MIS projects.

D. RESEARCH OBJECTIVES

The main thrust of this study is to develop an appropriate methodology for the design and implementation of MISs for the Indonesian Defense Logistics Staff. The methodology will be presented by developing an application of the small arms inventory MIS. It is hoped that this application can then be generalized for the use of designers and implementors for other required applications in Indonesia.

E. SCOPE AND LIMITATIONS

The research is limited to the retail level of the Small Arms Inventory System, which is one of the major inventory items of the Indonesian Defense Logistics System.

F. ORGANIZATION OF THE STUDY

The remainder of this thesis is composed of eight chapters with content as follows:

Chapter II is a literature review of the Organization and Mission of the office of the Indonesian Defense Logistics Assistant. Chapter III reviews the literature describing MIS development. Chapter IV contains the description of an appropriate model for The Indonesian Defense to use as a MIS design methodology. Chapter V describes a systematic decomposition of the functional requirements of the Small Arms inventory system. Chapter VI describes the data requirements, and maps those required data to each functional requirement with a data flow diagram. Chapter VII describes system interfaces. Chapter VIII offers conclusion and recommendations. Chapter IX contains appendices.

II. THE ORGANIZATION AND MISSION

A. THE ORGANIZATION AND MISSION OF THE DEFENSE LOGISTICS OFFICE

Within the Office of the Indonesian Minister of Defense, the logistics function is managed by the Assistant of Logistics. He is responsible to the Defense Administration Chief of Staff. The major functions of logistics are handled by eight sections which are responsible for Planning and Budgeting, Procurement, Supply, Maintenance and Disposal, Transportation, Medical, Industry, and Properties and Installations. Each of these eight sections is supported by three to four bureaus. (see Figure 2.1)

1. Planning and Budgeting Section

This section formulates and prepares logistics plans, prepares the logistics annual budget requirements, recommends improvement for the logistics support, and conducts staff evaluation on the implementation of logistics programs. This section is also responsible for developing the Materiel Coding System for uniform identification of all inventory items.

2. Procurement Section

This section formulates Policies, Procedures, and Regulations for the procurement of materiel and supplies. Centralized and decentralized procurement, includes contracts appropriate for different pricing situations, identification of domestic and logistics resources, and staff control of regional procurement.

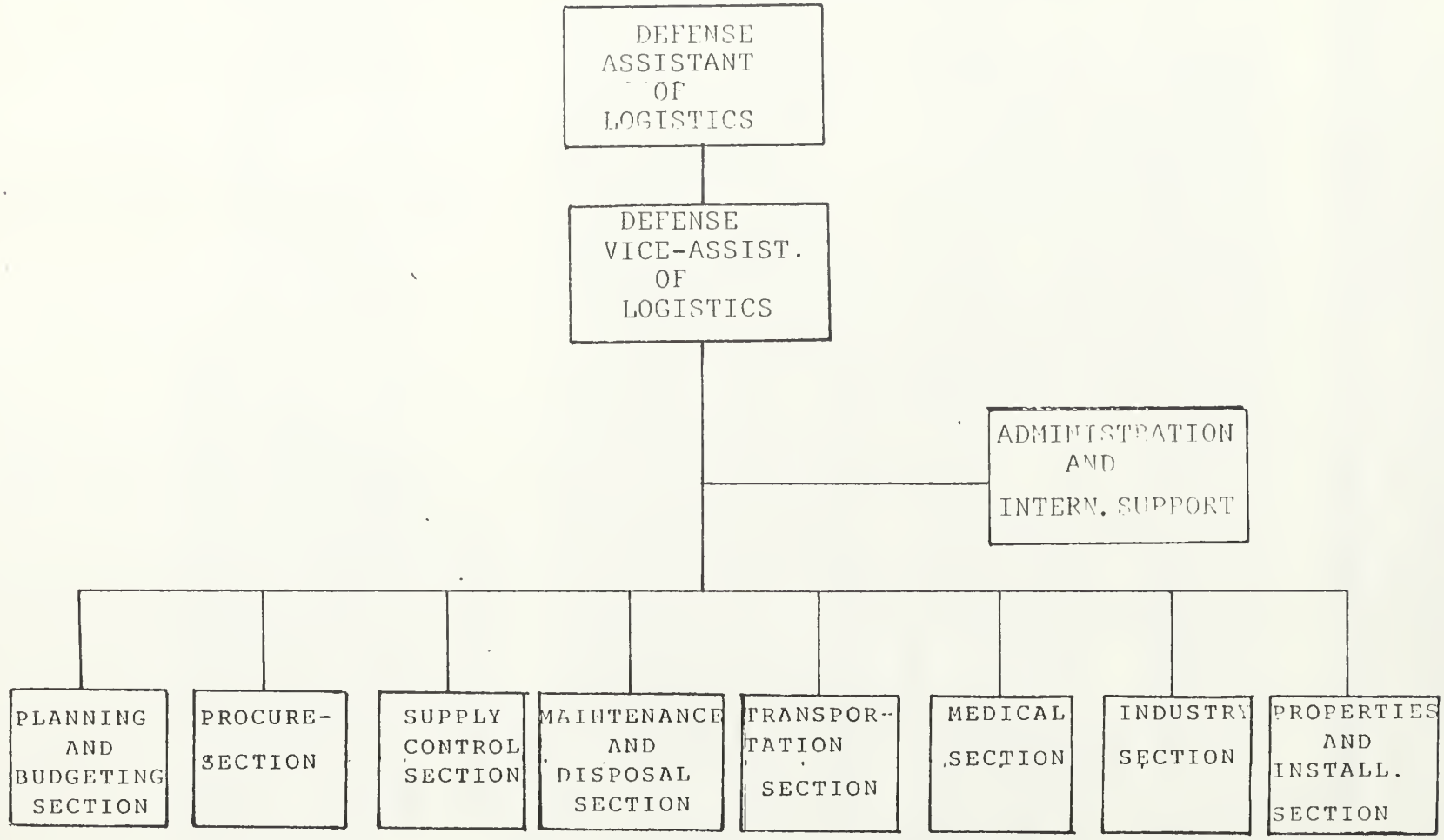

Figure 2.1 Organization of the Defense Logistics Office

3. Supply Control Section

This section formulates and develops Policies and Procedures for the control of common supply items, weapons and ammunitions, major equipment items, and electronics and communication equipment. This section also handles Inventory and Distribution management.

4. Maintenance and Disposal Section

This section formulates and develops Maintenance and Disposal procedures, evaluates inventory status, and establishes guidelines for efficient maintenance of major items.

5. Transportation Section

This section is responsible for the establishment of short and long range Planning, and Control and Administration of the transportation; including land, sea, and air.

6. Medical Section

This section is responsible for Planning and Provisioning of facilities and supplies for medical care.

7. Industry Section

This section monitors and evaluates non-defense industrial development. The result of the evaluation is used as an input for materiel order planning and for non-defense industry support of national defense requirements. This section also Plans and Develops management control and procedures for the defense industry.

8. Properties and Installation Section

This section formulates and developes policies and procedures for the management control of defense properties

and installations, planning of construction, and maintenance of installations.

B. THE EXISTING LOGISTICS MIS SUPPORT

Current MIS support is limited to the area of inventory status. Three of the eight sections of the Defense Logistics staff office described earlier (the supply control, the maintenance and disposal, and the properties and installations sections) are now using this support. Following is a brief description of the inventory status system [Ref. 5: p. 5].

1. Output Requirements and Users

The Annual Inventory Summary Report for the Office of the Minister of Finance contains material inventory status to include items such as number of weapons, weapons' conditions, weapons' location, weapons' present value.

Ad hoc Inventory Summary Reports for the Office of the Defense Administration Chief of Staff vary depending upon current requirements. They may contain, for example, number of combat readiness small arms, their location, and type of ammunition used. Other reports may contain a list of small arms by make, model, type, year, condition, and location.

Other more detailed reports are used by the Defense Logistics staff for internal management assist procurement, supply, maintenance, and disposal functions. These reports list the individual small arms and weapons including some, if not all , of the following data elements: make, model, type, year, serial number, manufacturer, condition, location, quantity, and reporting unit.

2. Source of Data

Data for the various reports come from the logistics staff offices at the Army, Navy, Air force, and Police headquarters where they are compiled from each basic reporting unit.

3. Automatic Data Processing Support

In the area of inventory, data currently being processed at the Defense Data Processing Center includes small arms and weapons, general and special purpose vehicles (does not include combat vehicles), and properties and installations.

The method of processing is batch. Normal updating of the materiel inventory files takes place every three months, while information on procurement of new material or disposal of obsolete material takes place monthly.

The Defense Data Processing Center provides automated data processing support with the use of Univac 1106 computers.

III. MANAGEMENT INFORMATION SYSTEM (MIS)

A. COMPUTER BASED INFORMATION SYSTEM'S DEVELOPMENT

Engineering techniques developed for computer hardware have reached a state of relative maturity in little more than three decades. Hardware design techniques are well established, manufacturing methods are continually improving and reliability is a realistic expectation, rather than a modest hope. Unfortunately, computer software still suffers because the demand for software continues unabated as computer-based systems grow in number, complexity and application. The key objectives of software engineering are :

1. A well-defined methodology that addresses a software life cycle of planning, development and maintenance.
2. An established set of software engineering components that document each step in the life cycle and show traceability from step to step.
3. A set of measurable milestones that can be reviewed at regular intervals throughout the software life cycle [Ref. 6].

The following sections will discuss phases in Software Life Cycles, where the life cycle is a long term view that encompasses the activities that occur before development begins and after the software goes into active use.

1. Planning Phase

Software is always part of a computer-based system, therefore systems analysis and definition must occur prior to (or in conjunction with) software planning. During this step a bounded description of the scope of software effort

is developed, resources required to develop the software are predicted and cost and schedule estimates are established, a software plan is produced and reviewed by project management.

The next step is to establish software requirements analysis and definition. During this step the system elements allocated to software are defined in detail. Information flow and structure provide the key to system performance requirements. Resource limitations are translated into software design characteristics. Global analysis of the software element defines validation criteria that will be used to demonstrate that requirements have been met. Software engineering analysis and definition are a joint effort conducted by the software developer and the requester, that is, the person or organization requesting the software element of a system [Ref. 6]. A software requirement specification is the configuration deliverable produced as a result of this step. The software planning phase culminates with a technical review of the software requirement specification, conducted by developer and requester. Once an acceptable requirements definition has been established, the scope, resource cost and schedule identified in the software plan are reevaluated for correctness. Information uncovered during the second planning step may impact estimates made during the first step. Deliverables developed during the software engineering planning phase serve as the foundation for the second phase in the process of software development.

2. Development Phase

The development phase translates a set of requirements into operational software. At early stages of development, a hardware engineer does not reach for a soldering iron, the software engineer should not reach for a coding pad, design must be accomplished first.

The first step of the development phase concentrates on a holistic approach to software. A modular structure is developed, interfaces are defined and data structures are established. Design heuristics (guidelines) are used for a qualitative evaluation of design quality. This preliminary design step is reviewed for completion and traceability to software requirements. A first draft design document is delivered and becomes part of the software configuration.

Procedural aspects of each modular element of the software are considered during the next development step. Design tools are applied to provide a detailed design description of the software element. Each detailed design description is added. The software methodology views coding as a consequence of good design. Code is reviewed for style and clarity, but should otherwise be directly traceable to a detailed design description. A source language listing for each modular element of software is the deliverable for the coding step. The last step of development is associated with software testing. Unit testing attempts to validate the functional performance of an individual modular component of software. Integration testing provides a means for assembly of the software modular structure while testing functions and interfaces.

3. Maintenance Phase

Software should always be maintained and 40 to 70 percent of many budgets are reserved for software maintenance. The software engineering maintenance phase begins prior to the release of the software. Review of the software configuration is conducted to assure that all documentation is available and adequate. Maintenance responsibility is established and a reporting scheme for error and system modification is defined. In all cases, modification of the software includes the entire configuration, not just code.

B. REQUIREMENT ANALYSIS TOOLS

Several requirement analysis tools have been developed to provide a set of procedures that guide an analyst through requirements specification.

1. Structured Analysis and Design Technique (SADT)

SADT is a methodology developed by Douglas T. Ross that is useful for requirements analysis as well as for design. It is a general purpose modeling technique that is applicable to a wide range of problems, not just computer applications. It has been in use since 1974 by several organizations and it is relatively well known in the software field. SADT consists of three things: a set of methods that assist the analyst in understanding complex subjects, a graphical language for communicating that understanding, and a set of management and human factor considerations for guiding and controlling the use of the method and the language. Even though in some projects, SADT applications have been successfully carried out manually, SADT also provides a computer's aid. So that, some people refer to SADT as automated requirement analysis tool. The methods of SADT are based on several concepts; top down decomposition is used to break complex topics into smaller pieces which can be understood more readily. Model building provides both, a way of communicating, and a way of understanding through abstraction from the real world.

Establishing and using explicit viewpoints for each model will help to control and limit the information in a model. Review and iteration are used to insure the quality of the model. Complementary analysis approaches are used to build on the activity/object duality of most situations. The graphical language of SADT uses boxes and arrows coupled together with a simple syntax. The basic unit in the

language is a box that indicates an activity or an object, the arrow indicates flows of data between activities or activities that operate on data. An SADT model is an ordered collection of diagrams. The diagrams are related in a precise manner so that they fit together to form a coherent model of the subject. The number of diagrams in a model is determined by the breadth and depth of analysis that is required for the purpose of that particular model.

2. Structured Systems Analysis (SSA)

SSA is a partial methodology. It is called a partial methodology because its components are not as well integrated as they might be and because it does not presently include much in the way of management guide lines. Some of its components bear a strong resemblance to SADT. There are two similar versions, One introduced by Gene and Sarson in 1977, and one by De Marco in 1978, which are called Structured Systems Analysis to differentiate them from SADT. SSA is beginning to be employed widely in traditional data processing environments. SSA uses many of the same concepts as SADT, including top-down decomposition, use of a graphical language, and model building as a means of communicating with users. In addition, it incorporates some important data base concepts. A major difference is that SSA is not an automated tool.

There are four main features in SSA; data flow diagrams, data dictionaries, process logic representations, and data-store structuring techniques. SSA's data flow diagrams are very similar to SADT actigrams, although there are some important differences. In particular, the decomposition appears to be used rather loosely and a more complicated graphical notation is used that shows data stores directly on the data flow diagram. SSA encourages use of a standard data dictionary system to record and define the

data elements that appear during the analysis and definition of a system. These are the data elements that appear on the data flow arrows of the diagrams which are produced as the first step in SSA. Once data stores have been defined through the analysis process, SSA suggests organizing the data stores immediately. Structuring techniques based on the relational model of data are prescribed to obtain efficiently designed stores, however any data structure can probably be used without difficulty.

In the decomposition process, one eventually reaches a level at which, specific algorithms must be described. SSA suggests the use of a process logic representation such as decision tables, decision trees, and metacode. Metacode, pseudocode or structured English is used when a long process should be taken and this process is repeated many times, so we can not use a decision tree anymore. An example of metacode is given in Figure 3.1

Different representations are suggested for different situations, but all have the advantage of being understandable by humans while still capturing, accurately, the intended sequence.

3. Problem Statement Language/Analyzer (PSL/PSA)

PSL/PSA is a tool for the description and analysis of system definition. It consists of a language for expressing specifications and an analyzer for processing the description. PSL/PSA was developed by Professor Daniel Teichroew of the University of Michigan and has been used by numerous organizations. PSL/PSA incorporates three important concepts. All information about the developing system is to be kept in a computerized, development-information data base. Processing of this information is to be done with the aid of the computer to the extent possible. Specifications are to be given in "what" terms, not "how" terms.

```
if student-status = 'international'
   and if curriculum = 'computer system'
       then numbers of quarters = 7
   else if the curriculum = 'computer science'
        then numbers of quarters = 8
   else depend on the justification of
        the chairman of the department
else (for US students)
     if curriculum = 'computer system'
     then numbers of quarters = 6
     else if curriculum = 'computer science'
          then numbers of quarters = 7
     else depend on the justification of
          the chairman of the department
```

Figure 3.1 An Example of Metacode

4. Software Requirements Engineering Methodology (SREM)

SREM includes tools, methods and procedures for their application. SREM was developed under the direction of the U.S. Army Ballistic Missile Defense program by several subcontractors and has been described extensively. Its usage to date, however, has been limited to the specification of large missile defense systems.

SREM shares the underlying concepts of PSL/PSA with some important additions. It focuses on technique applicable to real-time systems through some generalizations of the PSL/PSA approach. In particular it incorporates a "stimulus-response" model of real-time systems. It includes a graphical language and utilizes sophisticated graphical displays. It extends the PSA analysis concepts by incorporating automated simulation facilities to provide the analyst additional feedback on the characteristics of the system being specified [Ref. 7].

5. Business Systems Planning (BSP)

BSP was introduced by IBM in 1970. BSP is a methodology that aids System Analysts and Managers to identify the requirement analysis of the organization (functional requirements), and identifies the interrelationship among functions. BSP also identifies data that will be shared by the users, which is needed to perform each function. One of the distinctions between BSP and other methodologies is, BSP offers the assessment of future information system needs, so we can say BSP plays a role in supporting information system planning at the strategic level.

The analysis that is performed establishes the utility of taking architectural approaches to information systems, the implications of managing (or not managing) the data of the business holding the greatest relative potential from investing information system resources. The analysis does not result in design specifications or even cost benefit determinations. In order to get to that level of detail, additional analysis must be performed over and above that specified for the BSP. Therefore, to reiterate, BSP is planning oriented not design or implementation oriented, and they support the strategic level of IS planning. BSP answers questions such as these : "What design strategy should IS

employ ?", "What should the role of IS be ?", "What areas of the business hold the most potential for investing current IS resources ?", "Which IS resources should be optimized at the expense of each other ?".

The analytical approach employed by BSP is top down. Top down implies a high level of detail, that is, looking at the highest level of summarization and then decomposing hierarchically to lower levels of detail as required. Top down implies perspective, that is, the perspective of the highest levels of management as opposed to the operational levels of management.

The analysis is data oriented. Analysis that is performed for the purpose of defining requirements or defining design specifications tend to focus on function, information, or data. The analysis that is functionally oriented identifies and defines the function of the business that requires automation, specifies what the system has to do, and secondarily defines the data required or the information that is the by-product. In the context of "input-process-output", the primary focus is on the "process". It must be pointed out that even though BSP tends to focus on the data, the fact that it attempts to produce an architectural statement suggests that they must ultimately provide for a balance between data (input) and function (process) in support of the highly variable information (output) requirements of the business.

The analysis results in two analytical products, including:

1. A structure, or architecture, in information terms, which describes the business unit under study.

2. An identification of management's priorities as related to the structure developed.

The analysis employs management interviewing techniques as the source of data for determining the relative priorities of IS investment opportunities, see [Ref. 8] and [Ref. 9].

IV. APPROPRIATE DESIGN METHODOLOGY

A. APPROPRIATE REQUIREMENT ANALYSIS TOOL

In the previous chapter, five of the available requirement analysis tools have been described, now a question can be raised, which methodology / tool previously discussed will give the best result? In order to give the proper answer, it is better to understand why we need this tool? It is known that software engineering requirement specifications should be reviewed by software developers as well as by the users. Because this phase builds a foundation for each subsequent phase in software development. Extreme care should be taken in conducting this phase. Software engineers usually use reviews to validate the end product of this phase. This kind of review is called, by some writers, a technical review and by others a structured walkthrough. This review is repeated many times until the end product is considered to be " good quality ". We can think of this review as quality control / inspections of a manufactured product. This review is conducted by three to five people [Ref. 10]. It is necessary to give the documents to be examined to all reviewers, two or three days before the review, so the reviewers have enough time to study these documents.

Product review should consist of relatively small tasks, short enough so that the review can be completed in 30 - 60 minutes. The purpose of the review is to identify errors, not to correct the errors nor to argue about matters of personal approach or style. During the review, changes to the specification may be recommended. Even though this review has been conducted many times, a number of common

specification problems persist. Because the specification is difficult to test, inconsistencies may pass unnoticed. It is also extremely difficult to assess the global impact of a change, that is; how does a change in one function affect requirements for other functions ? (sensitivity analysis).

To solve some of these problems the specification tools have been automated. SADT, BSP, SSA are categorized as predominantly manual and SREM, PSL/PSA are predominantly automated [Ref. 6]. Predominantly automated tools need special sophisticated software, and there is no guarantee that this software will fit the existing Indonesian DOD's computer culture. Introducing a new methodology is always time consuming and takes a great deal of effort, like Machiavelly said :

> " There is nothing more difficult to take in hand, more perilous to conduct or more uncertain in its success, than to take the lead in the introduction of a new order of things".

BSP is the newest methodology among the five methodologies previously discussed. It promises higher expectations, partly because it is developed by a giant in the computer industry (IBM). So there is a possibility that BSP will be a standard in the requirement analysis tool area. On the other hand SSA has been widely accepted by many computer organizations, and the important thing is, some of the Indonesian DOD personnel have used this methodology, so it would be better to combine both these methodologies in conducting the software development for the Indonesian DOD.

B. DATA FLOW DIAGRAM (DFD)

Like an engineer who uses a miniature model for creating a huge building, a software engineer also requires a model to represent the software system. By modifying this model instead of the actual system, software engineers, can achieve the end product with minimum cost and effort. Modelling is a means of coping with problems of scope, by modelling we can divide the whole system into small pieces that we call subsystems [Ref. 11]. Since the partitioning is a useful representation, in miniature, of the whole system, people refer to it as a system model.

One of the tools to create such a model is the Data Flow Diagram (DFD). Data Flow Diagrams develop a logical, graphical model of the required system. By examining statements of the objectives of the system and the system constraints plus Data Flow Diagrams, analysts and users can derive a more meaningful requirement statement [Ref. 12]. In other words; a picture can represent more than a thousand of words. In this logical design context, the Data Flow Diagram is focused on specifying what the system or application is required to do. It does not state how the requirements should be accomplished or how the application should be implemented. But Data Flow Diagrams indeed represent what the system should do, independent of physical constraints. Physical designs can be developed that will be cost-effective for the situation in which it is to be used.

To reiterate, this logical model is graphic in nature, and is a good way to show the managers and non-system personnel, details of the system without worrying about the implementation of the processes. It is done by selecting the correct symbols and notation, therefore virtually, anyone can follow the way components in the system fit together. Data Flow Diagrams show and describe the

information flow and the processes (called transforms) that are applied as data moves from input to output. A single bubble (circle) is used to represent a software element with incoming and outgoing arrows indicating the input to the process and output of the process. Information sources and sinks are shown as labelled box symbols, and stored information (eg, data file or data store) is represented by a double horizontal line. The information source is the location where data originates and the information sink is the destination of data as it moves through the system. In general, the fundamental model is refined into a series of bubbles, each representing a transform that occurs along the information flow path from input to output. This Data Flow Diagram can be further refined to get greater detail of information flow. The diagram may be layered to show any desired level of detail. Figure 4.1 shows a Data Flow Diagram of a function called "Input Final Grade", which is initiated at the Professor and ends at the Registrar.

It is important to note, that no explicit indication of the sequence of events is supplied by the diagram. Procedure or sequence may be implicit in the diagram, but explicit procedural representation is generally delayed until detail software design phases which are performed later on.

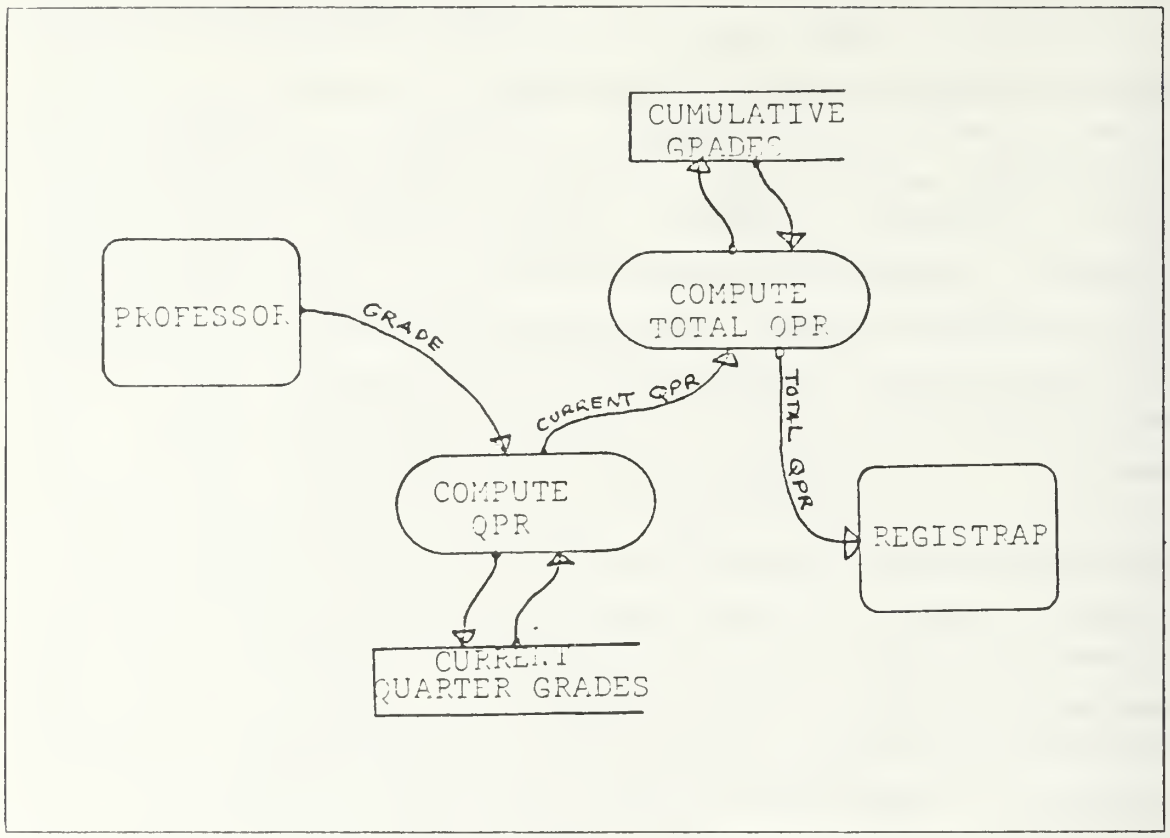

Figure 4.1 Example of Data Flow Diagram

C. HIERARCHICAL BLOCK DIAGRAM

We can also view data by its structure, Hierarchical Block diagrams depict information/data as a series of multi-level blocks organized as a tree structure. The entire hierarchy is represented by a single block which is placed at the top level of the structure. Succeeding levels contain blocks that represent various categories of information that may be viewed as a subset of the superordinate block. And in the lowest level of the diagram, each block represents individual data entities. In this way the Hierarchical Block Diagram can show the Analysts and users increasingly more

detailed as the structure is refined. The Analyst begins by categorizing top-level information, refinement continues along each path in the diagram until all information detail is established. Figure 4.2 shows an example of Hierarchical Block Diagram.

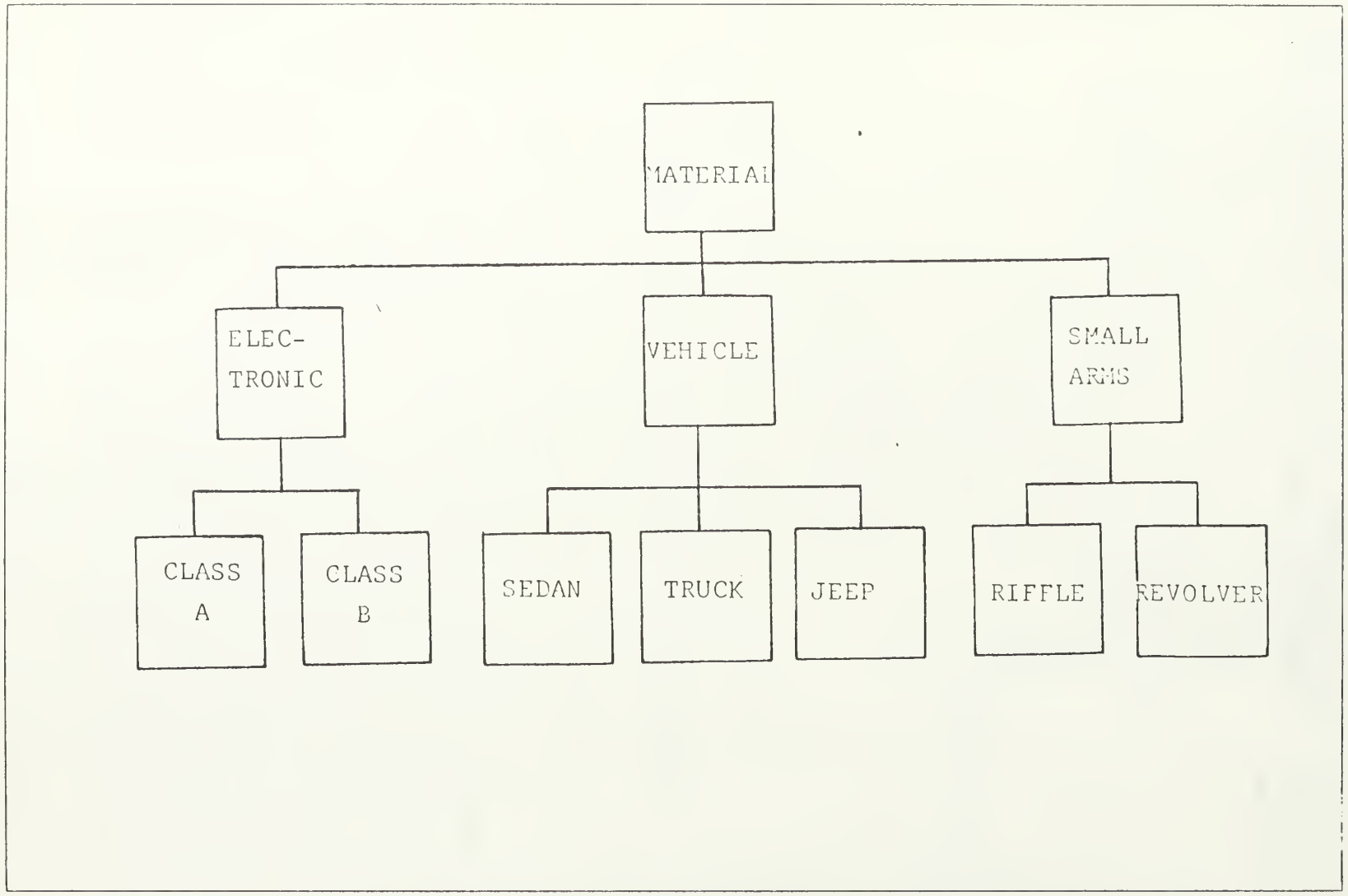

Figure 4.2 Hierarchical Block Diagram

V. FUNCTIONAL REQUIREMENT

A. OVERVIEW

The inventory management of small arms[1] system is central to logistics management. Successful logistics operations depend on the supplies. The flow of these supplies depends upon the effectiveness of the management of inventories.

B. OBJECTIVES

The objective of inventory management is effective, efficient, and economical supply. With the many compromises and tradeoffs which are necessary in logistics, this ultimate objective can become obscure. At all levels of the supply system there are limitations on the resources of logistics like transportation, facilities, as well as material [Ref. 13: p. 91].

C. DESCRIPTION

The function of inventory management is usually performed in two levels:

a. Wholesale
b. Retail

---

[1] See Appendix Terminology.

This thesis focuses on activity within the retail level, which includes:

1.0 Requisition function.
2.0 Maintenance function.
3.0 Inventory/Stock Control function.

These inventory functions are depicted in Figure 5.1.

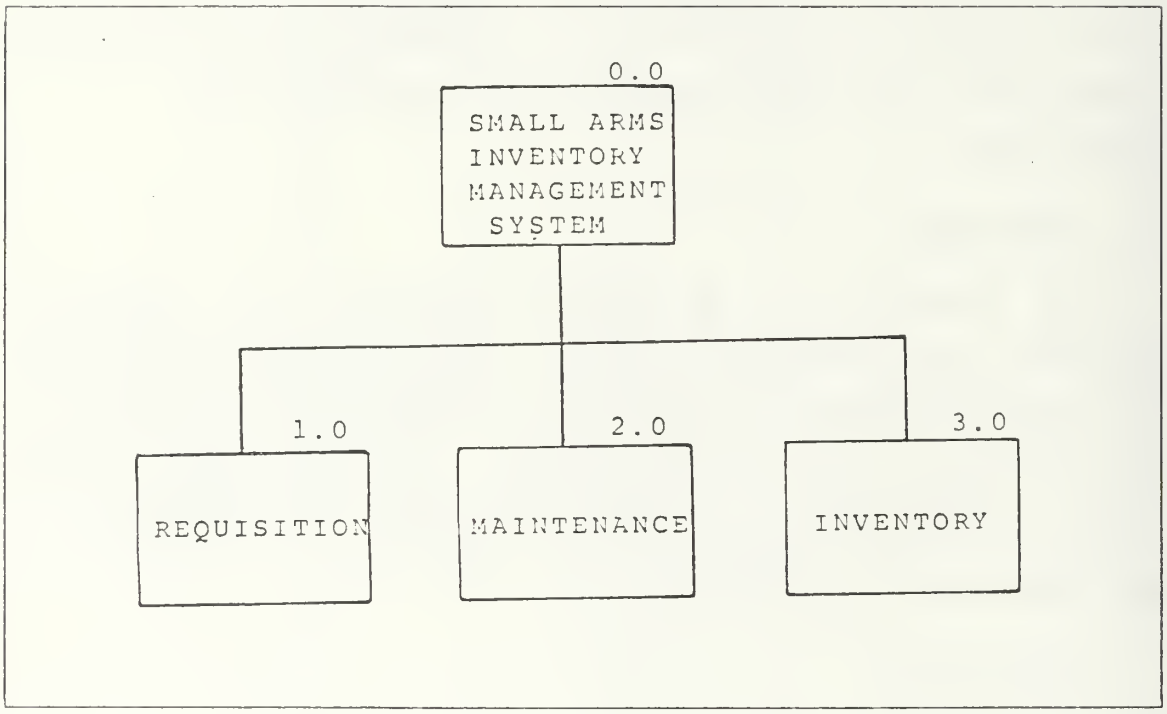

Figure 5.1 Small Arms Inventory Management Function

The following is a description of each function.

1. Requisitioning Function

Requisitioning is the principal function of the inventory management and is comprised of the following subfunctions:

1.1 ISSUE MATERIAL
1.2 RECEIVE MATERIAL
1.3 MODIFY REQUISITION
1.4 FOLLOWUP REQUISITION
1.5 CANCEL REQUISITION
1.6 TURN-IN MATERIAL

These requisition functions [Refs. 14,15,16: p. 3.40-3.60], are depicted in Figure 5.2.

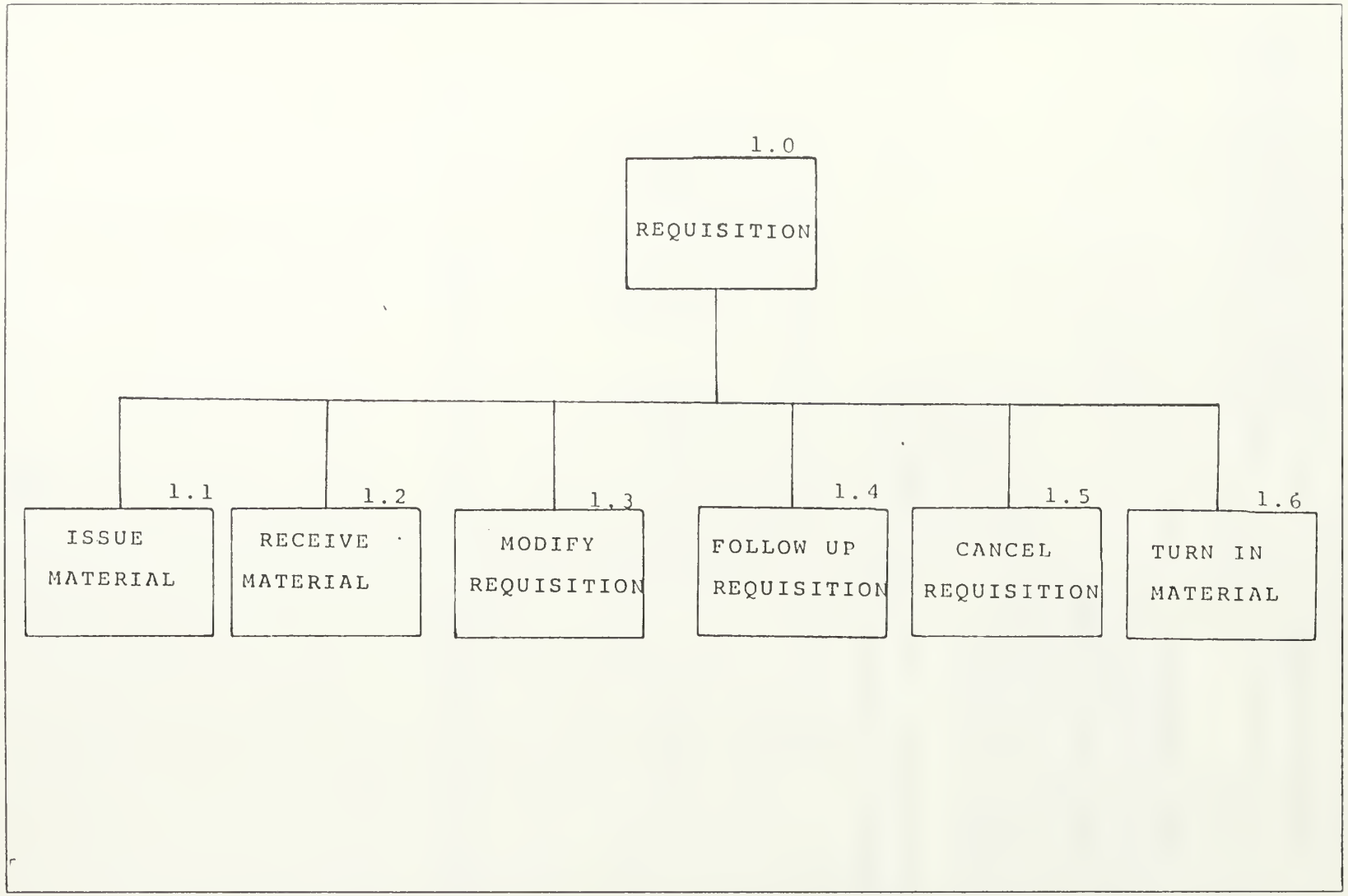

Figure 5.2 The Decomposition of Requisition Function

FUNCTION IDENTIFIER : 1.1

FUNCTION NAME : ISSUE MATERIAL

FUNCTION DESCRIPTION:

A request for issue is initiated by authorized personnel within the organization activity, using a standard request for issue document.

There are two categories of request for issue:

a. Routine Request: This request is considered as a routine request with priority designators[2] (PD's) 09-15.
b. High Priority Request: Requests with priority designators (PD's) 01-08, are considered high-priority request.

Both categories of request will be processed as follows:

a. Prepare and record required data into request for issue document.
b. Post this information on document register for supply actions.
c. Withdraw one copy of the request document and file it in the due-in status file.[3]
d. Forward the request to the division property book office (DPBO)[4] for approval.
e. Send the request to the Supply Support Activity[5] (SSA).

INPUTS : Data Requirement Material.

OUTPUTS : Approved Request for Issue Document.
Document Register for Supply Action.

---

[2] See Appendix Terminology.

[3] See Appendix Terminology.

[4] See Appendix Terminology.

[5] See Appendix Terminology.

Due-In Status File.

FUNCTION IDENTIFIER : 1.2

FUNCTION NAME : RECEIVE MATERIAL

FUNCTION DESCRIPTION :

The authorized organization[6] representative identified on the notice of delegation of authority-receipt[7] for supplies picks up the requested item at the designated storage location. This authorized representative should take the following actions:

a. Compare the Pre-position Receipt Card (PPRC)[8] with the attached item release/receipt document to insure that:

1. Document numbers are the same.
2. Stock numbers are the same.
3. The unit of issues are the same.
4. The quantity received is the same
5. All elements are included.

b. Post the date the item was received and the receiver's name and signature on the PPRC and receipt document.

Upon receiving the item, the organization takes the following action:

a. Post the receipt on the document register of supply actions.

b. Post the receipt on the due-in non-expendable listing.[9]

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[6] See Appendix Terminology.

[7] See Appendix Terminology.

[8] See Appendix Terminology.

[9] See Appendix Terminology.

c. Forward the signed PPRC and receipt document to edit and document control branch.

d. Withdraw and destroy copy of the requisition from the due-in status file and any other document pertaining to the receipt.

INPUTS : Pre-position Receipt Card.
Item Released/Receipt Document.

OUTPUTS : Document Register of Supply Actions.
Due-in non-expendable listing.

FUNCTION IDENTIFIER : 1.3

FUNCTION NAME : MODIFY REQUISITION

FUNCTION DESCRIPTION :

A request modifier document is used to modify information on previously submitted requisition. It is used only when the change pertains to the entire quantity requested. To modify previous requests the following action should be taken:

a. If the supply status card[10] has been received, use the latest status card, and enter modified data. (ie: priority designator, quantity, new document identifier code etc).

b. Otherwise prepare a request modifier and remake the supply request from the document register.

c. Record the appropriate modified data as follows:

1. If the priority was modified, replace the old onewith the new priority and authenticate this modified data.
2. Post the date and the new document identifier code.

---

[10] See Appendix Terminology.

d. Forward the request modifier to DPBO for approval.

e. Send the request modifier to the Supply Support Activity (SSA).

INPUTS : Data Modifier.
Supply Status Card.

OUTPUTS : Approved Request Modifier Document.

FUNCTION IDENTIFIER : 1.4

FUNCTION NAME : FOLLOWUP REQUISITION

FUNCTION DESCRIPTION :

The organization initiates an inquiry about a requisition previously submitted according to the time frame established by local procedures. Items requested with priority designator 09-15 do not require followup when SSA provides monthly supply status. The process of followup should include:

a. Prepare a new request for issue using data from the due-in status file copy of the previous request for issue.

b. Post followup data at the document register for supply action such as document identifier code.[11]

c. Forward the followup request to DPBO for approval.

d. Send the followup request to the Supply Support Activity (SSA).

Upon receiving the followup request reply from SSA (in the form of status card with certain document identifier code), take the following actions:

---

[11] See Appendix Terminology.

a. Erase the document identifier code and the date in the document register and post the estimated delivery date and status code.
b. File the status card in the due-in status file.

INPUTS : Request to followup.
Supply Status Card.

OUTPUTS : Approved followup request document.
Document Register For Supply Action.

FUNCTION IDENTIFIER : 1.5

FUNCTION NAME : CANCEL REQUISITION

FUNCTION DESCRIPTION :

A total or partial stopping of supply may be submitted to and confirmed by the Supply Support Activity at any time items are no longer needed. The process of requesting cancellation should include:

a. Prepare a request for cancellation using data from the due-in status file copy of the previous request for issue.
b. Post cancellation data at the document register for supply action.
c. Forward the cancellation request to DPBO for approval.
d. Send the cancellation request to Supply Support Activity (SSA).

Upon receiving the reply of the requested cancellation from SSA (in the form of status card), the following actions should be taken:

a. Post the cancellation data to the document register.
b. File the cancellation card in the document file until the updated due-in non-expendable listing is received from SSA.

c. Notify the storage activity that the request has been cancelled.

d. Destroy the cancellation card when the transaction no longer appears on the due-in non-expendable listing.

INPUTS : Cancellation Requirement.
Due-in Status File.

OUTPUTS : Approved Request Cancellation Document.
Document Register for Supply Action.

FUNCTION IDENTIFIER : 1.6

FUNCTION NAME : TURN-IN MATERIAL

FUNCTION DESCRIPTION :

The items are turned in to the designated storage activity or transferred to another organization. The division of property book office has authority to furnish disposition or turn-in instructions and direct that the item be transferred to another organization or to the designated turn-in point.

Turn-in may be required because of the following reasons:

a. Instruction from the DPBO.
b. Item must be sent to the higher maintenance facility.
c. Item is excess to the needs of the organization.

The function of turn-in should be performed as follows:

a. Request a required technical inspection prior to turn-in of the item.

b. Prepare and forward a request for turn-in document to the DPBO to have a document number assigned.

c. Turn-in the item to the appropriate turn-in point.

d. Forward the signed copy of the receipt for turn-in and copies of the supporting document to the DPBO.

e. Place one copy of all documents in the working file that contains the organization of the current hand receipt item listing.

f. When the turn-in shows up on the monthly hand receipt item listing, withdraw the request turn-in document and other supporting document from the working file and destroy them.

INPUTS : DPBO Instruction.
Maintenance Workingsheet.

OUTPUTS : Approved Request for Turn-In Document.
Hand Receipt Item Listing.

2. Performance Maintenance

Maintenance functions are performed on Small Arms to sustain those items at a fully mission capable condition. Material maintenance is the responsibility of the command with custody of the material. Each commander will provide for the maintenance of material issued to or under the control of his/her organization.

The maintenance tasks [Ref. 17: p. 3.31-3.38] consist of any action taken, ranging from simple preventive maintenance checks and services performed by operator/crew to complex depot level maintenance operations performed at fixed shop facilities (highest maintenance level).

This function is comprised of the following subfunctions:

2.1 PERFORM PREVENTIVE MAINTENANCE
2.2 PERFORM ORGANIZATIONAL MAINTENANCE

This maintenance function decomposition [Ref. 18: p. 22-25], is depicted in Figure 5.3.

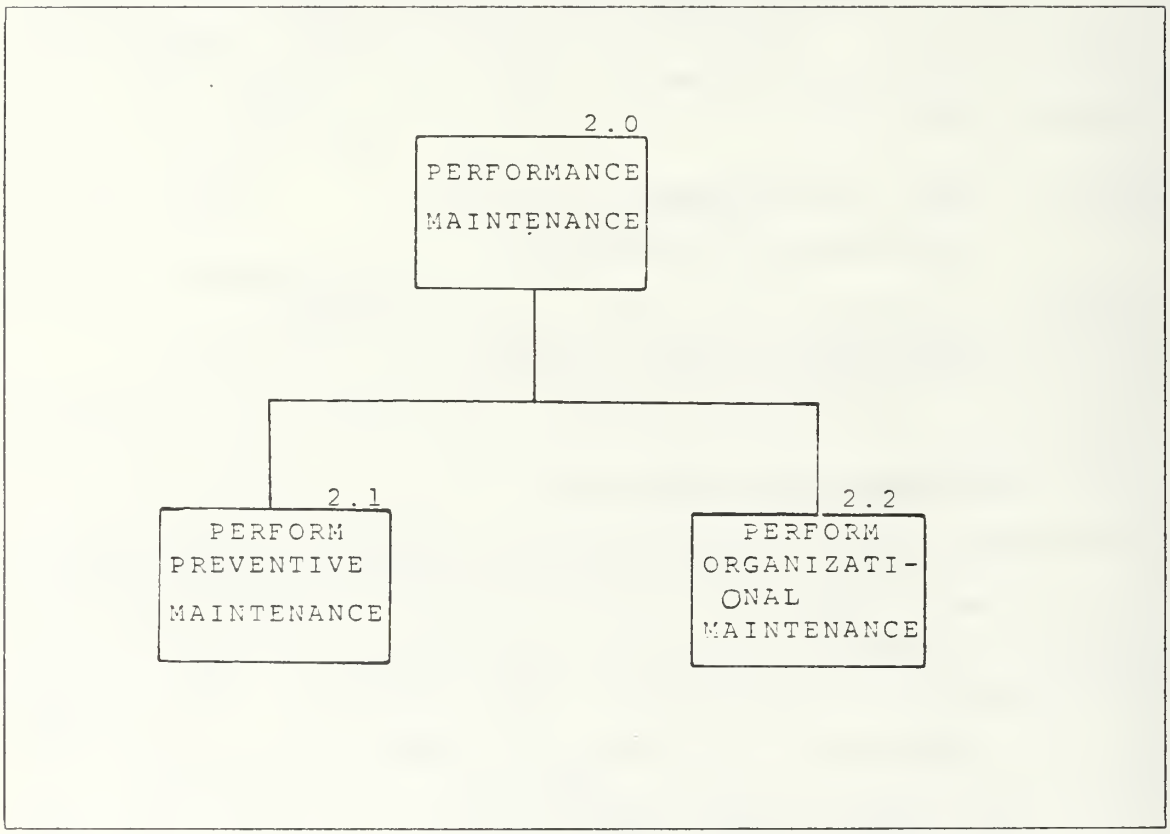

Figure 5.3 The Maintenance Function Decomposition

FUNCTION IDENTIFIER : 2.1

FUNCTION NAME : PERFORM PREVENTIVE MAINTENANCE

FUNCTION DESCRIPTION :

The daily preventive maintenance checks and services (PMCS) insure that the readiness of all applicable weapons are checked on a recurring basis and that a record is made of faults which cannot be corrected on the spot. The process of preventive maintenance should include:

a. The operator/crew follows the PMCS inspection steps listed in the applicable operator's manual. On-the-spot corrections are made whenever possible. Faults beyond the operator/crew capability and those which require parts must be recorded on the equipment inspection and maintenance worksheet.

b. If no faults, the weapon is made available for use. Faults noted during and after operations checks are recorded on the equipment inspection and maintenance worksheet marked 'DAILY'. If no additional faults are found, the weapon folder is returned to the weapon dispatcher. This cycle repeats the next day.

c. If a fault is noted, the operator/crew checks whether this fault has already been posted on the equipment inspection and maintenance worksheet marked 'DEF MAINT'. If not posted the operator/crew record the fault on the maintenance worksheet marked 'DAILY'. If they can repair the fault at a later time, they conduct repair and initial the fault as corrected.

d. Otherwise they report it to their supervisor and weapon dispatcher for corrective action by organizational maintenance. When deferred maintenance is accomplished, the person taking corrective action initials maintenance worksheet marked 'DEF MAINT'.

INPUTS : Maintenance Requirement.

OUTPUTS : Equipment Inspection.
Maintenance Worksheet.
Weapon Folder.

FUNCTION IDENTIFIER : 2.2

FUNCTION NAME : PERFORM ORGANIZATIONAL MAINTENANCE

FUNCTION DESCRIPTION :

Organizational level repairs are initiated whenever the maintenance supervisor receives the weapon folder and equipment inspection and maintenance worksheet from the weapon dispatcher. This organizational maintenance function process should include:

a. If the weapon has a fault but is operational, the weapon folder and maintenance worksheet marked 'DEF MAINT' are forwarded to the armor sergeant. But if the weapon is not operational, then a maintenance schedule and record document is marked before forwarding the records to the armor sergeant, who receives the document and assigns a mechanic to perform necessary repairs.

b. The mechanic performs the repair when authorized by the maintenance allocation chart and when parts or a higher level of maintenance support (depot maintenance) are not needed. When repairs are finished, the maintenance worksheet is posted and the weapon record document is forwarded to the armor sergeant when repairs have been completed and the document is returned to the weapon dispatcher.

c. The weapon dispatcher makes the item available for use and gives the weapon records clerk the current status, so pertinent documents can be annotated, if applicable.

INPUTS : Equipment Inspection
Maintenance Worksheet.
Weapon Folder.

OUTPUTS : Weapon Record Document.
Maintenance Workingsheet.

3. Manage Inventory

The inventory is a physical count of weapons on hand to insure that all item and documentation are given proper consideration in terms of reconciling counts to records.

This function [Ref. 14: p. 382], is comprised of the following three subfunctions:

3.1 Physical Counting
3.2 Data Matching
3.3 Reconciling

This functional decomposition is depicted in Figure 5.4.

FUNCTION IDENTIFIER : 3.1

FUNCTION NAME : PHYSICAL COUNTING

FUNCTION DESCRIPTION :

Small Arms will be physically inventoried by serial number at least once each month, and in addition whenever:

a. The responsibility for the custody of the arms storage facility keys is transferred between authorized individuals.
b. Prior to turn in or transfer to another organization.

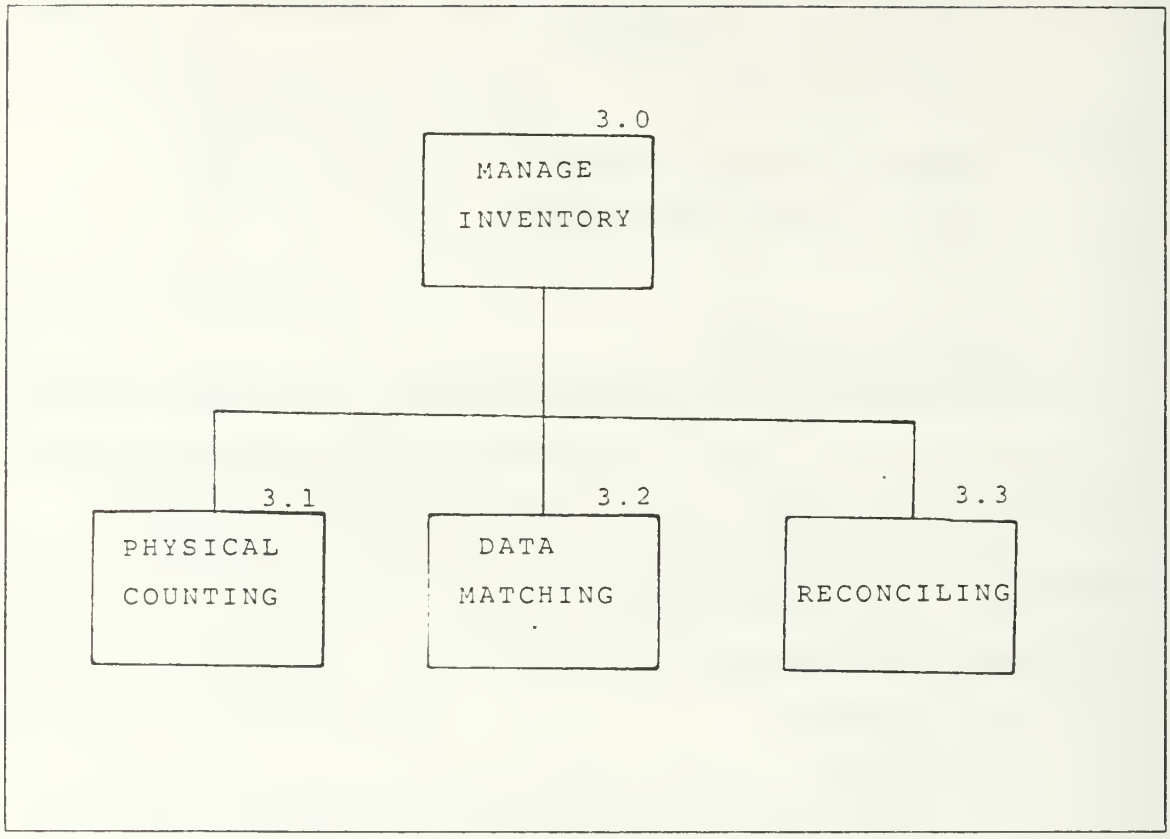

Figure 5.4 The Inventory Function Decomposition

All small arms which have been signed out overnight or sent to a maintenance activity will be annctated and supported by appropriate documentation.

The physical counting process will include:

a. The commander of the organization responsible for the arms room or storage facility may designate an individual to conduct the inventory. This designated individual will be other than the responsible individual. Consecutive delegated inventories will not be conducted by the same individual.

b. A small arms data file will be prepared to record the results of the inventory. The serial number of each small arm will be recorded.

INPUTS : Monthly Inventory Requirement.
Transferred Custody Requirement.

OUTPUTS : Small Arms Data File.

FUNCTION IDENTIFIER : 3.2

FUNCTION NAME : DATA MATCHING

FUNCTION DESCRIPTION :

The commander will insure verification of the serial number against those recorded on the organization hand receipt listing on the quarterly basis. Match the small arms data file against an authorized automated listing of serial numbers that may be attached in lieu of a physical count. Hand Receipt Listings will also be used to record and match the inventory to reflect the total quantity of small arms prior to turn-in or transfer.

INPUTS : Small Arms Data File.
Hand Receipt Listing.

OUTPUTS : Hand Receipt Listing.

FUNCTION IDENTIFIER : 3.3

FUNCTION NAME : RECONCILING

FUNCTION DESCRIPTION :

If the discrepancies are noted then it will be researched or surveyed and posted in the inventory survey document. It is necessary to retain this document as an exhibit to a report of survey. The adjustment document will be prepared and processed in accordance with property

accountability, and will account for lost, damaged and destroyed property [Ref. 19: p. 2.5].

INPUTS : Inventory Discrepancy Listing.

OUTPUTS : Inventory Survey Document.

VI. MAPPING DATA REQUIREMENT

A. OVERVIEW

Mapping data with the function requirement described above is an effort to define which data is required by which function. This required data will then be categorized with respect to the role it plays for that function.

B. DESCRIPTION

The data has been defined as it is required for the scope of the system, by first isolating on the view of the data only, ignoring any relationship to function. The result is the logical grouping of data called data classes, or data entities.

This data class[12] consists of a unique number, data description, key attribute and relationships to other data classes. These relationships are further defined as being one-to-one, one-to-many, and many-to-many. The following will describe both the data structure representation and data dictionary from the defined data class that mapped to each of the functions.

---

[12] See Appendix Terminology.

C. DATA STRUCTURE REPRESENTATION

1. Data Relationships Chart

The purpose of this chart is to identify the relationships between each data class and to document it in a graphic form. A one to many relationship exists between two data classes when for each occurrence of one data class there is the possibility of many occurrences of the second. If this relationship exists in both directions, then it is called a many to many relationships. Figure 6.1 illustrates possible relationships between data classes of the small arm inventory system.

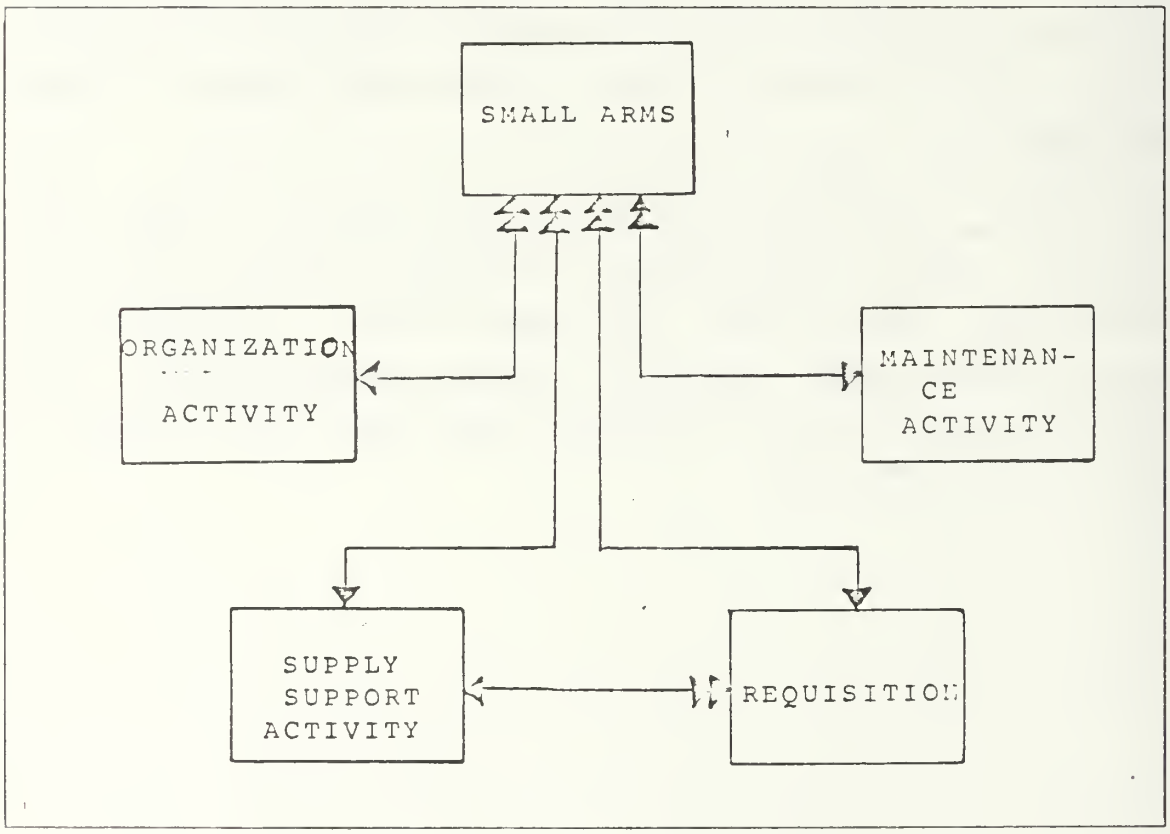

Figure 6.1 Data Relationship Chart

2. Data Class Descriptions

1.a. Data Class Name:
SMALL ARMS

b. Data Class Description:
The name given to the material that is managed throughout the inventory management system.

c. Indicative key:
Stock Number (SN).

d. Cross Reference Key:
Document Number (Requisition).
Unit Identifier Code (Organization Activity).
SSA Name Supply Support Activity).
Maintenance Status (Maintenance Activity).

e. Retrieval Key:
Manufacturer and Part Number.

2.a. Data Class Name:
REQUISITION

b. Data Class Description:
The name given to the request for small arms from an organization activity to the supply support activity. It includes the requisition for issue, receipt, modification, cancellation, follow-up and turn-in.

c. Indicative Key:
Document Number.

d. Cross Reference Key:
Stock Number (Small Arms).
SSA Name (Supply Support Activity).

e. Retrieval Key:
Document Identifier Code.

3.a. Data Class Name:
SUPPLY SUPPORT ACTIVITY

b. Data Class Description:
The name given to the entity (object) that provides supply support to the organization.

c. Indicative Key:
SSA Name.

d. Cross Reference Key:
Document Number (Requisition).
Stock Number (Small Arms).

e. Retrieval Key:
SSA Name.

4.a. Data Class Name:
ORGANIZATION ACTIVITY

b. Data Class Description:
The name given to the entity (object) that provides the management of small arm inventories.

c. Indicative Key:
Unit Identifier Code (UIC).

d. Cross Reference Key:
Stock Number (Small Arms).

e. Retrieval Key:
Organization Name.

5.a. Data Class Name:

MAINTENANCE ACTIVITY

b. Data Class Description:

The name given to the entity (concept) that describes the activity that performs maintenance functions on small arms in the organization.

c. Indicative Key:

Maintenance Status.

d. Cross Reference Key:

Stock Number (Small Arms).

e. Retrieval Key:

Maintenance Status.

D. DATA DICTIONARY

1. Data Class Listing

DATA CLASS	ATTRIBUTE NAME	SIZE	FORMAT
a. SMALL ARMS :			
	Condition Code	2	alphabetic
	Location	5	numeric
	Manufacturer	25	alphabetic
	Stock Number	15	numeric
	Nomenclature	25	alphameric
	Part Number	15	numeric
	Price	10	numeric
	Serial Number	10	numeric
b. REQUISITION :			
	Advice and Status Code	2	alphameric
	Date of requisition	4	numeric
	Document Identifier Code	3	alphabetic
	Document Number	14	alphameric
	Fund Code	2	numeric
	Hand Receipt Number	5	numeric
	Media and Status Code	1	alphameric
	Priority Designator	2	numeric
	Project Code	3	alphabetic
	Publication Data	50	alphameric
	Quantity	5	numeric
	Received From	40	alphameric
	Request From	50	alphameric
	Request Delivery Date	3	numeric
	Routing Identifier Code	3	alphameric
	Route to	3	alphabetic

DATA CLASS	ATTRIBUTE NAME	SIZE	FORMAT
	Signal Code	1	numeric
	Supplementary Address	5	alphameric
	Type Requirement Code	1	alphameric
	Unit of Issue	2	alphabetic
c. ORGANIZATION ACTIVITY :			
	Address of Organization	50	alphameric
	Organization Name	50	alphameric
	Unit Identifier Code	5	alphameric
d. SUPPLY SUPPORT ACTIVITY :			
	Address of SSA	50	alphameric
	Issued By	20	alphameric
	Send to	75	alphameric
	Ship to	40	alphameric
	SSA Name	50	alphameric
e. MAINTENANCE ACTIVITY :			
	Corrective Action	50	alphameric
	Deficiency and Shortcoming	50	alphameric
	Initial Corrected	5	alphabetic
	Maintenance Status	1	alphameric
	Type of Inspection	10	alphabetic

2. Data Attribute Descriptions

ATTRIBUTE NAME	DESCRIPTION
Address of Organization	Used to represent Commands, Units, or Geographic location used primarily for addressing of communication to Supply Support Activities.
Address of Supply Support Activity	Used to represent Authorized Activities; used primarily for addressing of communication or distribution system to organization activities.
Advice and Status Code	A code used to transmit instructions considered by by the creators of requisitions to be essential to the desired supply actions. This code is the opposite of status code in that directional flow is reversed.
Condition Code	Identify the degree of serviceability, condition and completeness in terms of readiness for issue and use.
Corrective Action	Describes the action being taken to support maintenance and lists all repair parts replaced or needed.
Date of requisition	The document date on which the item was requested.
Date of requisition	Describes the item faults that should be corrected/repaired includes the additional publication data that covers them.
Distribution	Designated activities eligible to receive continuing status describing current requisition actions.

ATTRIBUTE NAME	DESCRIPTION
Document Identifier Code	Identifies the basic type of administrative action, the specific sub-type of supply transactions, and related modifying instructions for each type of supply and movement document used throughout the supply system.
Document Number	A unique number constructed to identify the military service, requisitioner, required date, and serial number.
Fund Code	Identifies the type of funding which is to be charged.
Hand Receipt Number	A locally designed number used to post the location of the items/properties.
Initial Corrected	Indicates that the item faults have been fixed by mechanic/repairmen.
Issued By	Describes the activity which issued the item requested.
Location	Describes the physical location of the item.
Maintenance Status	Indicates the type of deficiencies and level of maintenance required.
Manufacturer	Name of the actual producer of a product.
Media and Status	Indicates the type of status to be furnished, designates the activity to receive status, and the method of communication.

ATTRIBUTE NAME	DESCRIPTION
Name	Indicates the name of either the concept or object like SSA, Organization Acticity.
Nomenclature	the name of the item being inventoried.
Part Number	The unique number assigned by the manufacturer which is usually unique for a particular manufacturer.
Price	The price of a single unit of issue for the item being requested.
Priority Designator	Describes the relative importance of the requirement.
Project	The code that identifies the requisition and related document and that are applicable, shipment of material, and provided funding.
Publication Data	Describe additional data concerning the item that is being inventoried. Such as: Technical Manual, Supply Catalog etc.
Quantity	Describes the quantity in unit of issue, for a particular requisition.
Received From	The name of the activity from which the requisition is originated.
Request Delivery Date	Identifies delivery deadlines by julian date, for the activity described in the shipped to field.
Request From	Name of the activity for use or stock to be issued to users from which the requisition is originated.
Route to	Describes the originating activity.

ATTRIBUTE NAME	DESCRIPTION
Routing Identifier Code	Identifies the inventory control point which exercises inventory control over the item.
Send to	Describes the point of delivery to be used by the supply support activity.
Serial Number	The total series of characters on the firing component part of a small arm.
Ship to	Identifies the activity that should receive the item.
Signal Code	Indicates the activity to be "shipped to" or to be "billed to ".
Stock Number	Identifies the item uniquely by property managers.
Supplementary Address	Identifies other activities as delivery points depending on the signal code.
Type Requirement Code	Describes the transaction in terms of type. (initial issue, replacement, increase stock etc)
Unit of Issue	Describes the unit of a measurement for the item. (EA, BX, ROLL; etc)
Unit Identifier Code	Identify uniquely, each organization of the active services.

3. Data Attribute Listing

NO	ATTRIBUTE NAME	DATA CLASS	SIZE	FORMAT
01	Address of Organization	Organization Activity	50	Alphameric
02	Address of SSA	Supply Support Activity	50	Alphameric
03	Advice & Status Code	Requisition	2	Alphabetic
04	Condition Code	Small Arms	2	Numeric
05	Corrective Action	Maintenance	50	Alphameric
06	Date of Requisition	Requisition	4	Numeric
07	Deficiency and Shortcoming	Maintenance	50	Alphameric
08	Distribution	Requisition	3	Alphameric
09	Document Identifier Code	Requisition	3	Alphameric
10	Document Number	Requisition	14	Alphameric
11	Fund Code	Requisition	2	Numeric
12	Hand Receipt Number	Requisition	5	Numeric
13	Initial Corrected	Maintenance	5	Alphabetic
14	Issued By	Supply Support Activity	50	Alphameric
15	Location	Small Arms	5	Numeric
16	Maintenance Status	Maintenance	1	Alphameric
17	Manufacturer	Small Arms	25	Alphabetic
18	Media and Status	Requisition	1	Alphameric
19	Name	Supply Support Activity	50	Alphameric
		Organization Activity	50	Alphameric

NO	ATTRIBUTE NAME	DATA CLASS	SIZE	FORMAT
20	Nomenclature	Small Arms	25	Alphameric
21	Part Number	Small Arms	15	Numeric
22	Price	Small Arms	7	Numeric
23	Priority Designator	Requisition	2	Numeric
24	Project	Requisition	3	Alphameric
25	Publication Data	Requisition	50	Alphameric
26	Quantity	Requisition	5	Numeric
27	Received From	Requisition	50	Alphameric
28	Request Delivery Date	Requisition	3	Numeric
29	Request From	Requisition	40	Alphameric
30	Route To	Requisition	3	Alphabetic
31	Routing Identifier Code	Requisition	3	Alphameric
32	Send To	Supply Support Activity	75	Alphameric
33	Serial Number	Small Arms	10	Numeric
34	Ship to	Supply Support Activity	40	Alphameric
35	Signal Code	Requisition	1	Alphabetic
36	Stock Number	Small Arms	15	Alphameric
37	Supplementary Address	Requisition	5	Alphameric
38	Type Inspection	Maintenance	10	Alphabetic
39	Type Requirement Code	Requisition	2	Alphameric
40	Unit of Issue	Requisition	2	Alphabetic
41	Unit Identifier Code	Organization	5	Alphameric

4. Data Attribute to Function Cross Reference

NO	ATTRIBUTE NAME	FUNCTION USING ATTRIBUTE
01	Address of Organization	1.1; 1.2; 1.3; 1.4; 1.5; 1.6
		2.1; 2.2
		3.1; 3.2; 3.3
02	Address of SSA	1.1; 1.2; 1.3; 1.4; 1.5
03	Advice & Status Code	1.1; 1.2; 1.3; 1.4; 1.5; 1.6
04	Condition Code	1.2
		2.1; 2.2
05	Corrective Actions	2.1; 2.2
06	Date of Requisition	1.1; 1.2; 1.3; 1.4; 1.5; 1.6
		2.1; 2.2
		3.1; 3.2; 3.3
07	Deficiencies & Shortcoming	2.1; 22
08	Distribution	1.2; 1.4; 1.5
09	Document Identifier Code	1.1; 1.2; 1.3; 1.4; 1.5; 1.6
10	Document Number	1.1; 1.2; 1.3; 1.4; 1.5; 1.6
		2.1; 2.2
		3.1; 3.2; 3.3
11	Fund Code	1.1; 1.2; 1.3; 1.4; 1.5
		2.1; 2.2
12	Hand Receipt Number	1.2; 1.6
		3.2; 3.3
13	Initial Corrected	2.1; 2.2
14	Issued By	1.2
15	Location	1.1; 1.2
		2.1; 2.2
		3.1; 3.2; 3.3
16	Maintenance Status	2.1; 2.2
17	Manufacturer	1.1; 1.2
18	Media and Status	1.4, 1.5
		2.1; 2.2
		3.1, 3.2, 3.3

NO	ATTRIBUTE NAME	FUNCTION USING ATTRIBUTE
19	Name	1.1; 1.2; 1.3; 1.4; 1.5; 1.6 2.1; 2.2 3.1; 3.2; 3.3
20	Nomenclature	1.1; 1.2; 1.3; 1.4; 1.5; 1.6 2.1; 2.2 3.1; 3.2; 3.3
21	Part Number	1.2; 1.6 2.2 3.1; 3.2; 3.3
22	Price	1.2
23	Priority Designator	1.1; 1.3; 1.4; 1.5 2.1; 2.2
24	Project	1.1; 1.2; 1.3; 1.4; 1.5; 1.6 2.1; 2.2
25	Publication Data	1.1; 1.2; 1.6 2.1; 2.2
26	Quantity	1.1; 1.2; 1.3; 1.4; 1.5; 1.6 2.1; 2.2 3.1; 3.2; 3.3
27	Received From	1.2; 1.6
28	Requirement Delivery Date	1.1; 1.3; 1.4; 1.5
29	Request From	1.2; 1.6
30	Route To	1.1, 1.2, 1.3, 1.4, 1.5, 1.6
31	Routing Identifier Code	1.1; 1.4; 1.5
32	Send To	1.2
33	Serial Number	1.2; 1.6 2.1; 2.2 3.1; 3.2; 3.3

NO	ATTRIBUTE NAME	FUNCTION USING ATTRIBUTE
34	Ship To	1.2; 1.6
35	Signal Code	1.2
36	Stock Number	1.2; 1.6 2.1; 2.2 3.1; 3.2; 3.3
37	Supplementary Address	1.2
38	Type Inspection	2.1; 2.2
39	Type Requirement Code	1.1; 1.2; 1.3, 1.4; 1.5; 1.6 2.1; 2.2 3.1; 3.2; 3.3
40	Unit of Issue	1.1; 1.2; 1.3; 1.4; 1.5; 1.6 2.1; 2.2 3.1; 3.2; 3.3
41	Unit Identifier Code	1.1; 1.2; 1.3; 1.4; 1.5; 1.6 2.1; 2.2 3.1; 3.2; 3.3

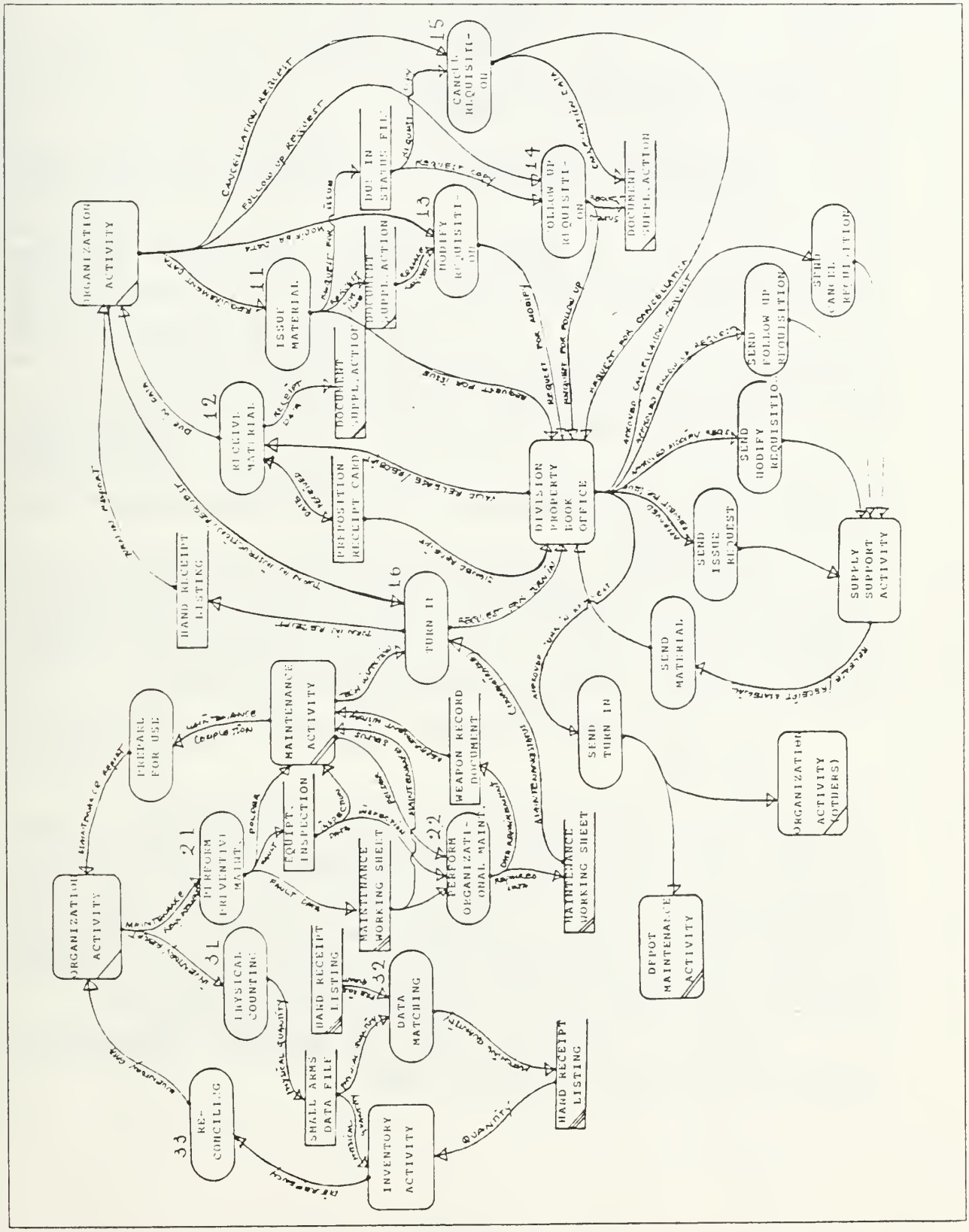

Figure 6.2 Small Arm Inventory Data Flow Diagram

VII. SYSTEM INTERFACE

A. SYSTEM INTERFACES DESCRIPTION.

1. Organization Activity / Division Property Book Office

This is a person-to-person interface existing between anyone from the supply office of the organization activity who require the material and the property book officer in the division property book office (DPBO) who has responsibility to maintain property book accountability.

The supply man prepares any type of material requisition described in previous chapters (Functional Requirement), and forwards it to the division property book officer for approval.

The division property book office sends any status on the material requested that was received from the supply support activity (SSA) to the organization activity (requisition originator) until the requisition is filled.

2. Division Property Book Office / Supply Support Activity

This is an interface existing between DPBO and SSA. The DPBO edits and verifies the correctness of a requisition form and also validates funds availability. If everything is valid then the requisition will be approved and processed and sent to the appropriate SSA. Otherwise the incorrect requisition is sent back to the requisition originator.

The SSA sends any status of material requested to requisition originator through DPBO.

3. Organization Activity / Maintenance Activity

This is a person-to-person interface existing between the armor sergeant from the organization activity and the maintenance supervisor in the maintenance activity.

The armor sergeant prepares and submits the maintenance requisition form to the maintenance supervisor. The maintenance supervisor checks whether the deficiency and shortcoming can be repaired under his/her maintenance activity. For the unrepairable material, the maintenance supervisor sends a message to the armor sergeant that this material should be turned-in.

The maintenance supervisor also makes a technical inspection to material prior to turn-in as requested by the organization.

4. Organization Activity / Inventory Activity

This is a person-to-person interface existing between anyone from the supply office of the organization activity who require the material to be physically inventoried and the designated individual in the inventory activity who conducts the inventory. The consecutive delegated inventories will be conducted by different designated individuals.

The commander of the organization who is responsible for the arms storage facilities may designate those individuals. The supply man sends the inventory form attached with authorized automated hand receipt listing to the designated individual to conduct the inventory. The designated individual will report any discrepancies to the organization.

The physical inventory is conducted to certain material prior to turn-in.

VIII. CONCLUSIONS AND RECOMMENDATIONS

This final chapter presents the conclusion and recomendations of this research effort. It emphasizes that there is a cause and effect relationship between the failure of the MIS to be developed and the appropriate methodology being applied, besides the intention of the manager's participation.

A. CONCLUSIONS

Many authors have studied the success and failures of MIS, and of all the reasons for development failure, not just lack of managerial participation but the improper methodology implemented in each development phase. The objective of this study was to develop an appropriate design methodology by presenting an application of small arms inventory system. Such method was selected so that it would be available as a guide or reference for both the functional managers and the designer in the development of a succesfull MIS.

Chapter IV of this study gave an analysis and determined what is the appropriate method. This determination showed that this method to be considered should be well understood by both the developer and the functional managers within the logistics office.

The logistics functional managers were the ones who know well the objectives, the policies and regulations, either formally written or not, and they were also the ones who had the final judgement. The depth of managerial involvement within the appropriate design methodology might not be the same, however the structure analysis and design tool

supported by the educated designer and managerial control should always be present.

The time is rapidly approaching when the logistics MISs will become a vital part of the operation of the Indonesian Defense Logistics Office, and the success of that MIS will depend on the existing well defined methodology, and both the effective involvement of the logistics managers and well knowledge designer.

B. RECOMMENDATIONS

From the technical point of view, Indonesia's DOD should always maintain the skill of their Information Systems Personnel, it means they should always be aware of the possibility of the emerging of a new methodology in software design. Software engineering is a relatively new discipline, so it changes dynamically. In 1970's the System Flowchart was used to depict flow of data within a system. Nowadays the Data Flow Diagram is considered as a good tool in depicting the flow of data. The presence of business system planning as a new analysis requirement tool, is another example of how dynamically the evolution has been in software engineering. Indonesia's DOD should encourage the use of the modern methodology, and to not merely cling to the conventional methodology.

But the adoption of the new methodology should be accomplished very carefully. There is no guarantee that a successful methodology applied in the USA will also work in Indonesia. There are many factors that should be considered in adopting a new methodology such as; environment, software and hardware availability, educational background of top managers, culture etc. Many Indonesians, who had graduated from abroad, tend to apply their new methodology when they came back to their office, without doing the necessary

"tuning" or adjustment they try to change all the old system and start implementing the new system in a short period of time. But unfortunately, in many cases, they fail.

The adoption of the new methodology should be carried out step by step. It always takes a long time and a great effort to change the present system to the new one. Standardization of the data element is necessary to avoid misunderstandings about interpretation of the data element. Usually when one item has several names and several items have the same name, as described in the first chapter, there is a period of chaos. Data class and data dictionary / data directory systems will help solve this problem.

However, when it comes to the actual MIS implementation, the outline needs to be developed further as to how the methodology should take effect. Further research is therefore recommended. This further research can be approached by:

a. The application of the Small Arms inventory system, as outlined in this research, should be followed by a more detailed analysis, for instance, the example of determining the function requirement as discussed in chapter V.
b. The application of this design methodology, as outlined in this research, to other inventory items in the Indonesian Defense Logistics Office.

For this additional research, the following suggestions are offered:

a. A seminar-type staff meeting between the Defense Logistics Office and the Defense Data Processing Center should be conducted. The seminar should provide the participants with current inventory problems and issues in the defense logistics area, followed by ideas on how the appropriate MIS design methodology, as outlined in this research can be applied.

b. Other current MIS literature could be used that may expand and improve the MIS design methodology as already outlined.

APPENDIX A
TERMINOLOGY

1. SMALL ARMS :

All types of weapon including:

a. Operated weapons that are portable and handguns
b. Shoulder fired weapons
c. Light automatic weapons up to and including .50 caliber machineguns
d. Recoilles rifles up to and including 106 mm
e. Mortars up to and including 81 mm
f. Rocket launchers, man-portable
g. Grenade launchers, rifle- and shoulder-fired
h. Individual-operated weapons that are:

1) Portable and can be fired without special mounts or firing devices.
2) Potential use in terrorist or civil disturbance activities.
3) Vulnerable to theft.

Also including all types of weapon that mounted on aircraft, vehicles and vessels that are accounted for in unclassified property records.

2.a OVERVIEW :

The logistics system does not have the resources to respond to all requisitions within the same time frame. A system must be derived to insures that support is provided according to the military importance of the requesting organization and the urgency of need.

2.b PRIORITY DESIGNATOR (PD) :

The originator of a logistics support request must normally assign it a priority designator (PD). This PD is based on a combination of the force activity designator and the urgency of need.

2.c FORCE ACTIVITY DESIGNATOR :

Shows the mission essentiality of a unit, organization, installation or program to meet the objectives.

2.d URGENCY OF NEED :

Is determined by the essentiality of material requisition to the accomplishment of the military mission.

3. DUE-IN STATUS FILE :

This file is maintained at the organization office and contain supply status cards which give the requestor information about due-in material.

4. DIVISION PROPERTY BOOK OFFICE (DPBO) :

The DPBO organization includes the property book team, a report and edit document control branch. Each property book team handles the supply transactions and manages the hand receipt accounts for designated organization of the division. All supply transactions and documentaffecting division property book records go through the DPBO.

5. SUPPLY SUPPORT ACTIVITY (SSA) :

Any activity in the retail level having a supply support mission such as direct support unit and installation supply divisions.

6. ORGANIZATION :

a. Any military unit; specifically, a larger command composed of two or more smaller units (battallion). In this meaning, a military element of a command is an organization in relation to its components.

b. The definite structure of a military element prescribed by competent authority.

7. NOTICE OF DELEGATION OF AUTHORITY RECEIPT :

The unit or battallion commander (hand receipt holder), prepare a notice of delegation of authority receipt document for individuals delegated the authority to receive supplies requested.

8. PRE-POSITION RECEIPT CARD (PPRC) :

These cards are prepared by an activity that maintain a formal stock record account for receipt, storage, and issue of property; and send to the receiving activity. It contains:

a. Ownership code.
b. Condition code.
c. Materiel management code.
d. Routing identifier code.

9. DUE-IN NON-EXPENDABLE LISTING :

A listing of requisitions for which material is due-in.

10. NON-EXPENDABLE ITEMS :

Items which are not consumed in use, retain their original identity during the period of use, and require that accountability be maintained throughout the life of the items.

11. SUPPLY STATUS CARD :

A supply status card is a notice of a supply decision made by a supplier. It tells the requsitioner of the action to be taken on a certain requisition. The supply support activity furnishes the DPBO (division property book office) supply status cards with document identifier code. The status code on the status card indicates the type of action that has to be taken. The PBT (property book team) keeps status cards furnished by the supply support activity and files them with the organization request.

12. DOCUMENT IDENTIFIER CODE (DIC) :

a. The DIC identifies a given product (i.e: requisition, status cards receipt etc.) to the distribution system to which itpertains. Also identifies data as to its intended purpose and usage.

b. Enables people to recognize the data and perform the operation dictated.

c. Mandatory entry on all documents and related product enter the supply system.

13. DATA CLASS :

A logical grouping of data about entities which are significant to the inventory system, including people, places, things, events, and concepts.

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